



Project Overview

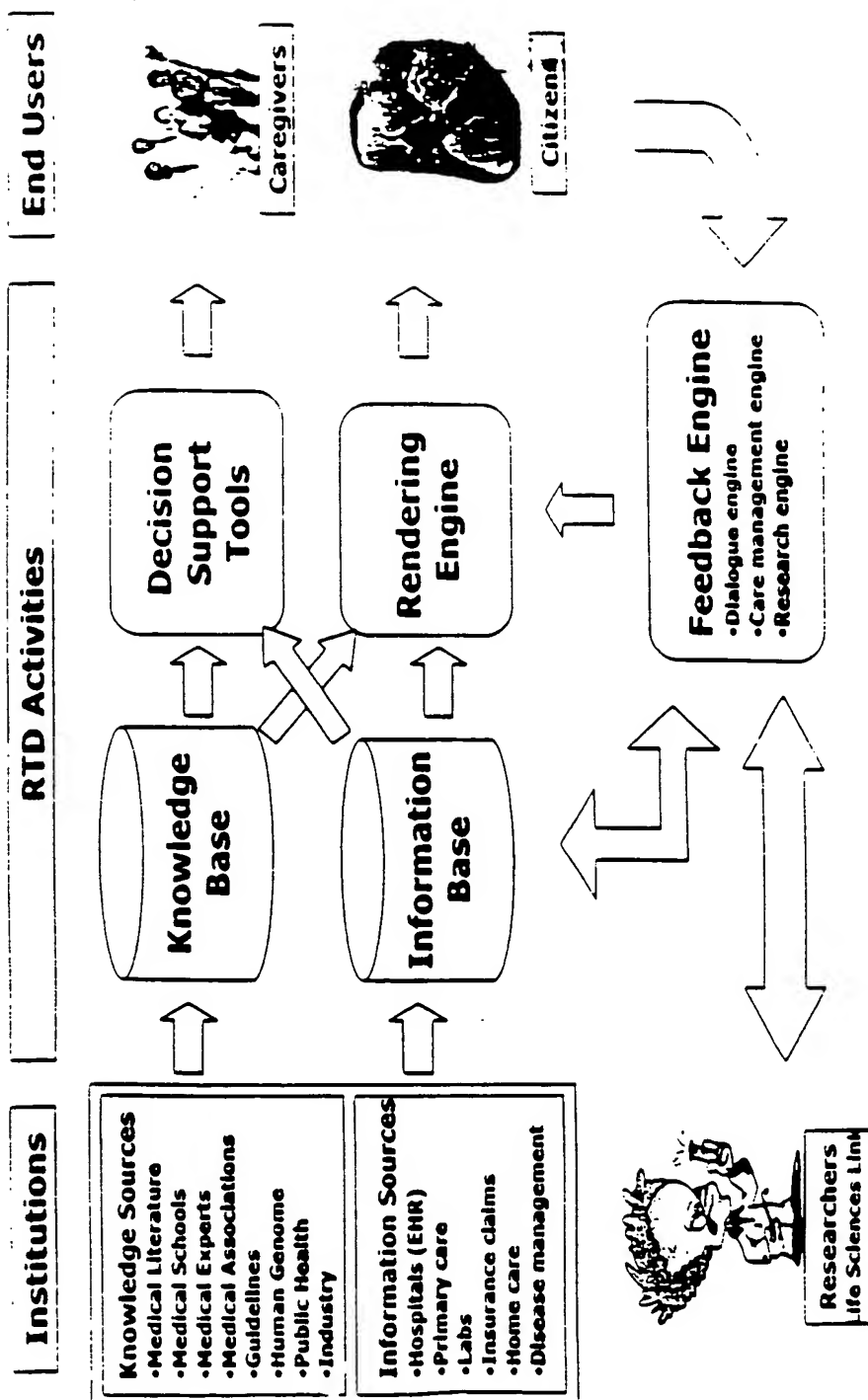
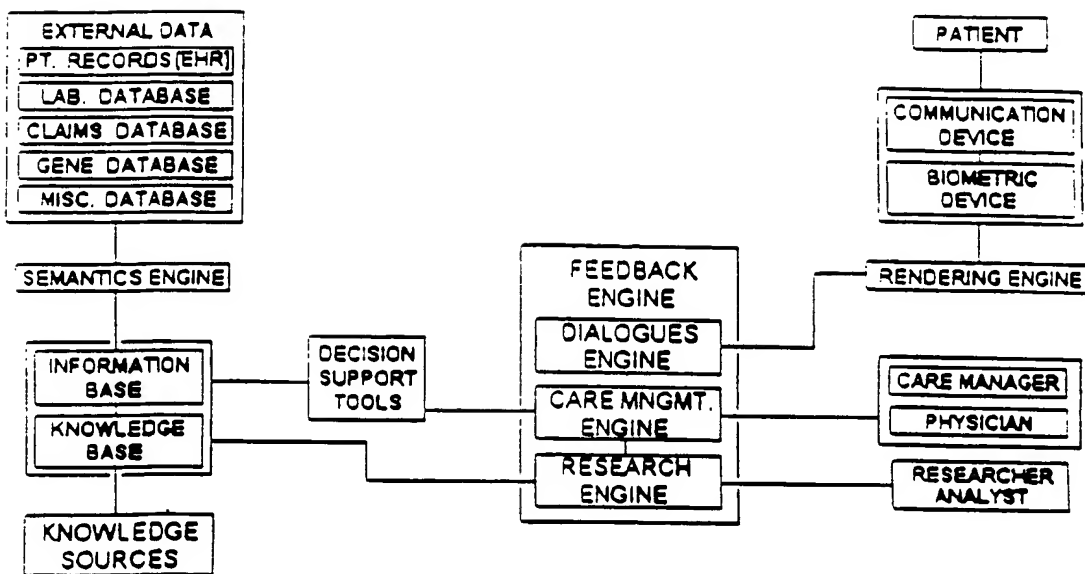


FIG. 1



SYSTEM ARCHITECTURE

System Architecture, from the viewpoint of Feedback Engine

FIG. 2

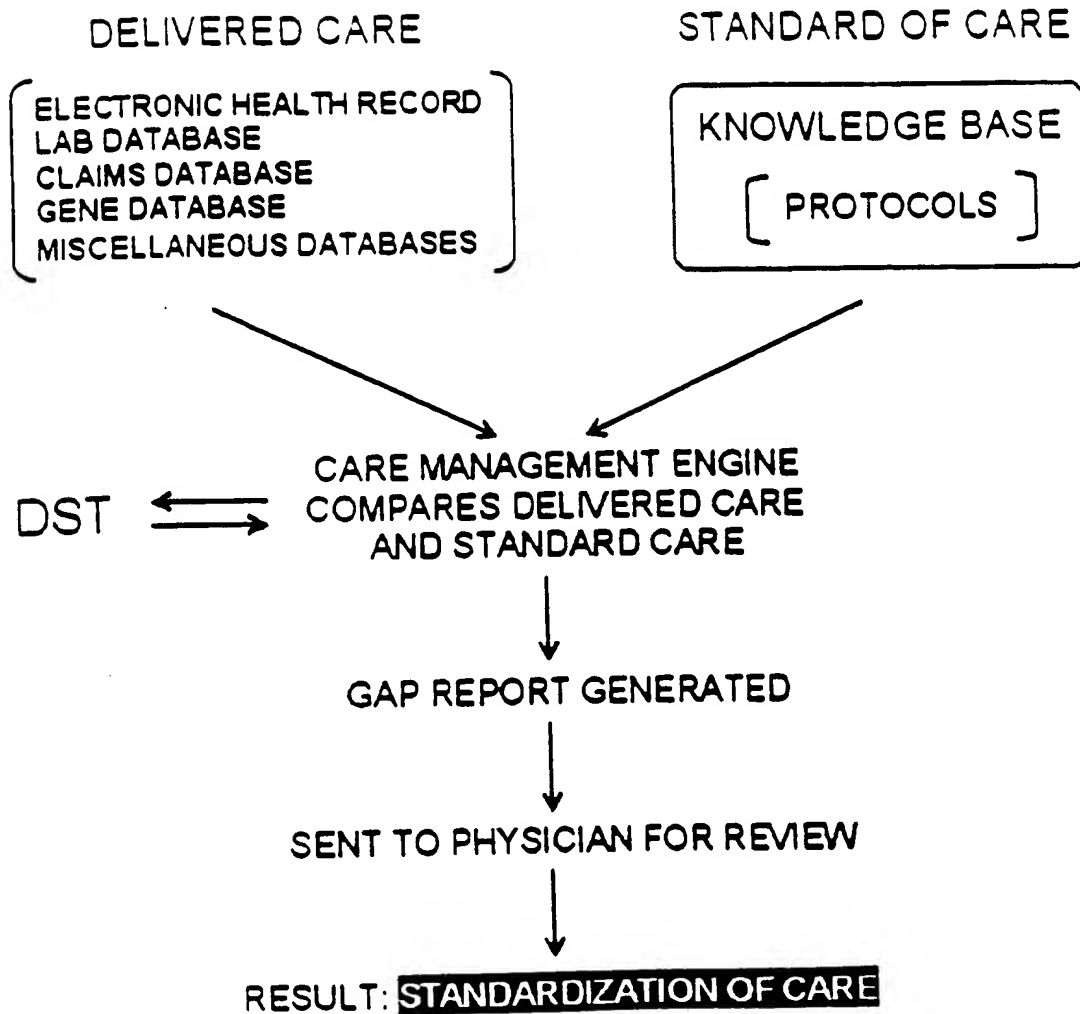


FIG. 3

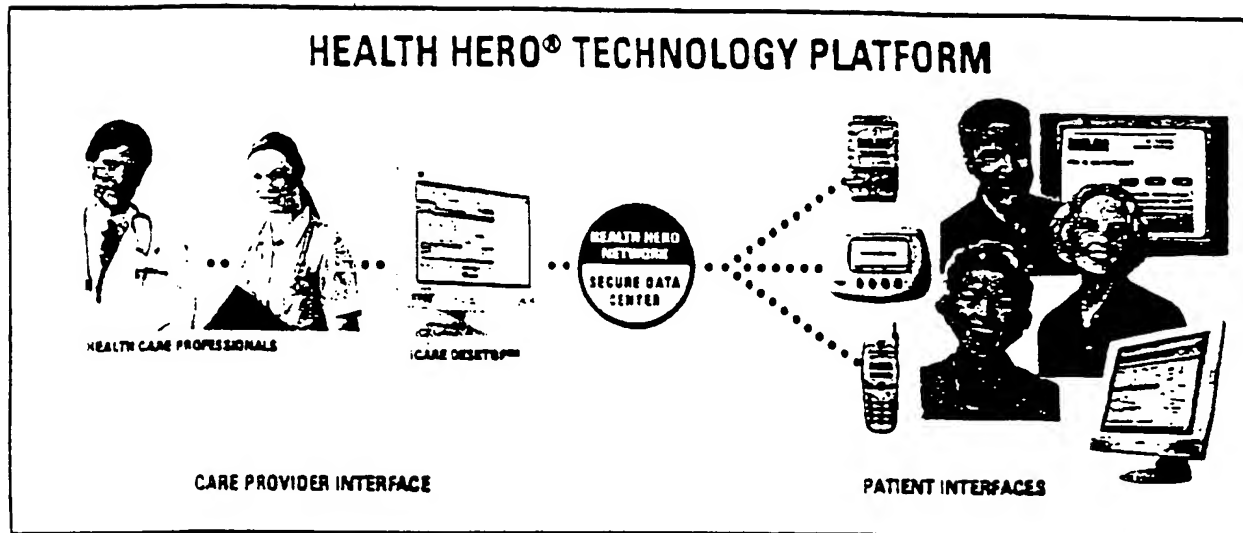


FIG. 4

Geoffrey Clapp
 Wed, November 26, 2003

Find Patient:

(Link Home)

Home Patient Reports Enrollment Disenrollment Schedule Setup

You have 7 unreviewed in box items: 1 Alert, 6 High Risk Results, and 1 Note overdue.

Care Index

Date	Category	Subject
<input type="checkbox"/> 07/21/2003	Alert	2 pound weight gain for patient Gill, Hal
<input type="checkbox"/> 07/21/2003	Results	High Risk Symptoms for Patient Luma, Craig
<input type="checkbox"/> 07/21/2003	Results	High Risk Symptoms for Patient Clapp, Geoff
<input type="checkbox"/> 07/20/2003	Results	High Risk Symptoms for Patient Coli, Laurie
<input type="checkbox"/> 07/19/2003	Results	High Risk Symptoms for Patient Cherry, Julie
<input type="checkbox"/> 07/19/2003	Results	High Risk Symptoms for Patient Mann, Marie
<input type="checkbox"/> 07/19/2003	Results	High Risk Symptoms for Patient Wo, Dave

FIG. 5

Luna, Craig
Fri, April 4, 2003

**Health Hero
NETWORK**

Find Patient:

[Contact Health Hero](#)
[Help](#)
[Log Out](#)

Home
Patient
Reports
Enrollment
Disenrollment
Schedule
Setup

Work List
Profile
Results
Trends
Notes

Use these options to change the work list below.

1. Show patients from which program? 2. For which session date? 3. For which care manager?

(mm/dd/yyyy)

[Printer-friendly version](#)
[Create Work List](#)

You are viewing sessions for Nov 19, 2003 in the "All Programs" Program
Date:

Responders' Risk Summary

	Symptoms	Behavior	Knowledge	General
	2	2	0	0
Medium Risk	0	1	2	0
High Risk	6	5	4	2
None	0	0	0	6

Patient Summary

Responders	8
Non-Responders	4

Responses on Monday, November 19, 2003

Patient	Response Time	Sympt.	Behav.	Knowldg.	Gen.
● Lang, Nancy	08:38 AM PST				
● Cherry, Julie C.	08:41 AM PST				None
● Beninger, Jennifer	11:15 AM PST			Medium	None
○ Messing, Mel	10:16 PM PST		Medium		None
○ Lapp, Mary	09:38 AM PST			Medium	None
○ Coll, Laura	10:09 PM PST				None
○ Hoff, Jane	11:14 AM PST				
○ Man, Maria	09:12 AM PST				None

[Back to top](#)

FIG. 6

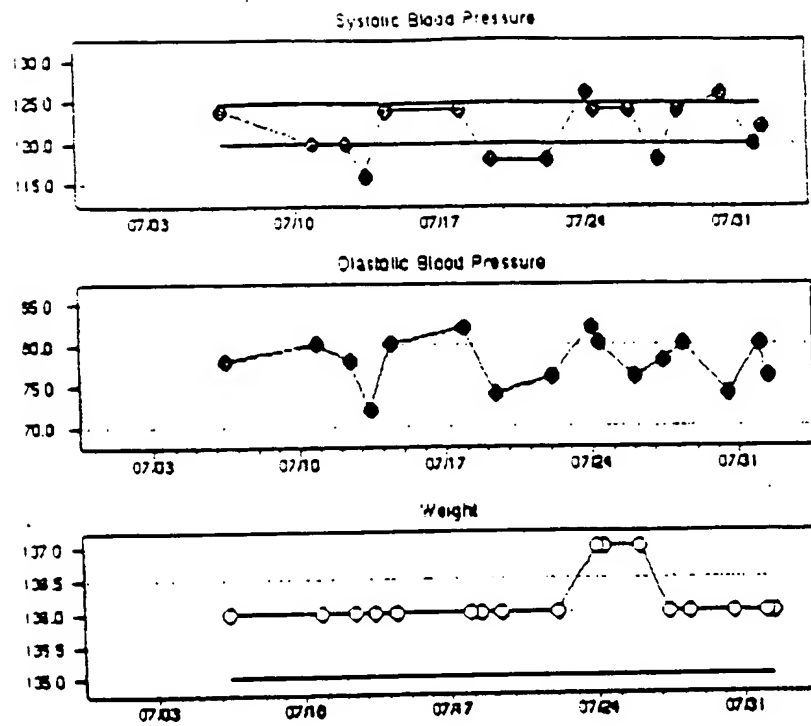
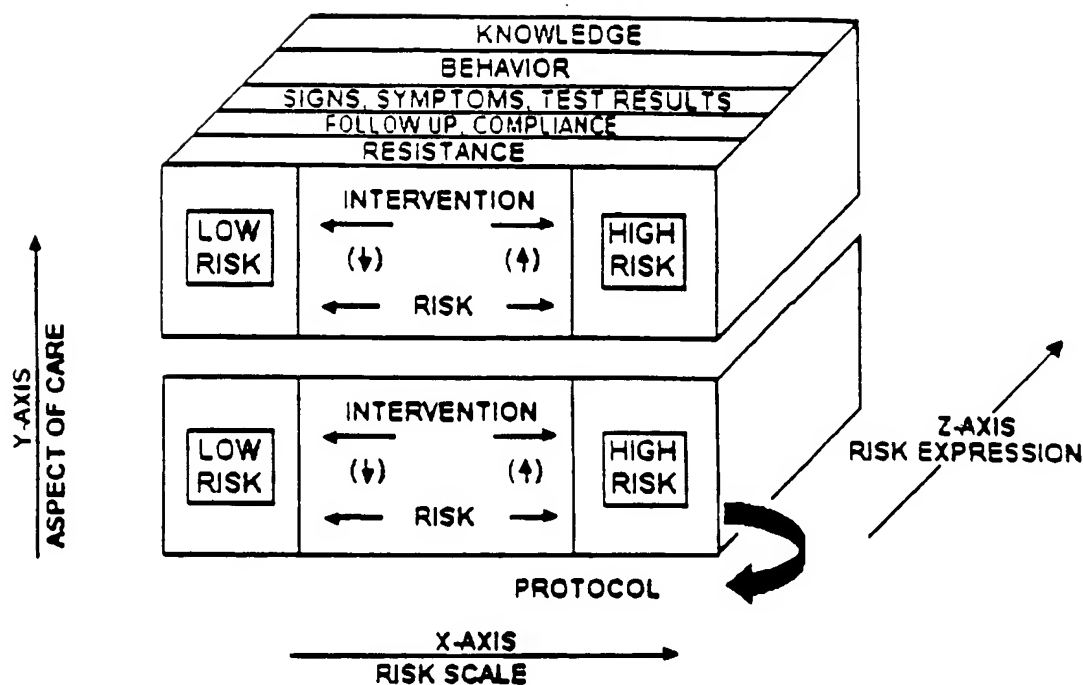


FIG. 7



FIG. 8



A 3-dimensional model of disease.

FIG. 9

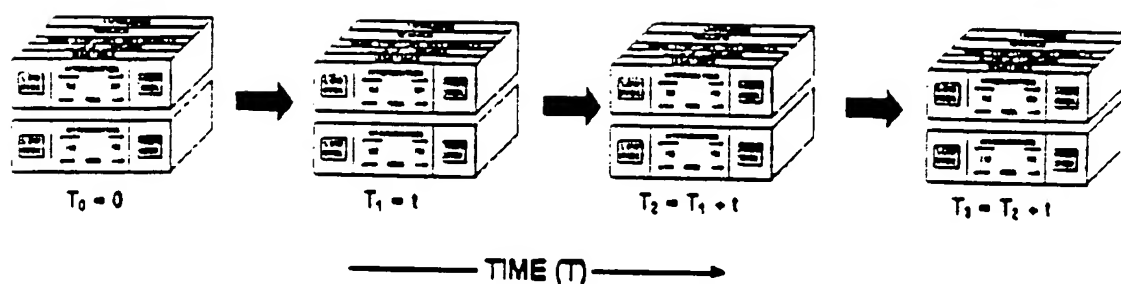


FIG. 10

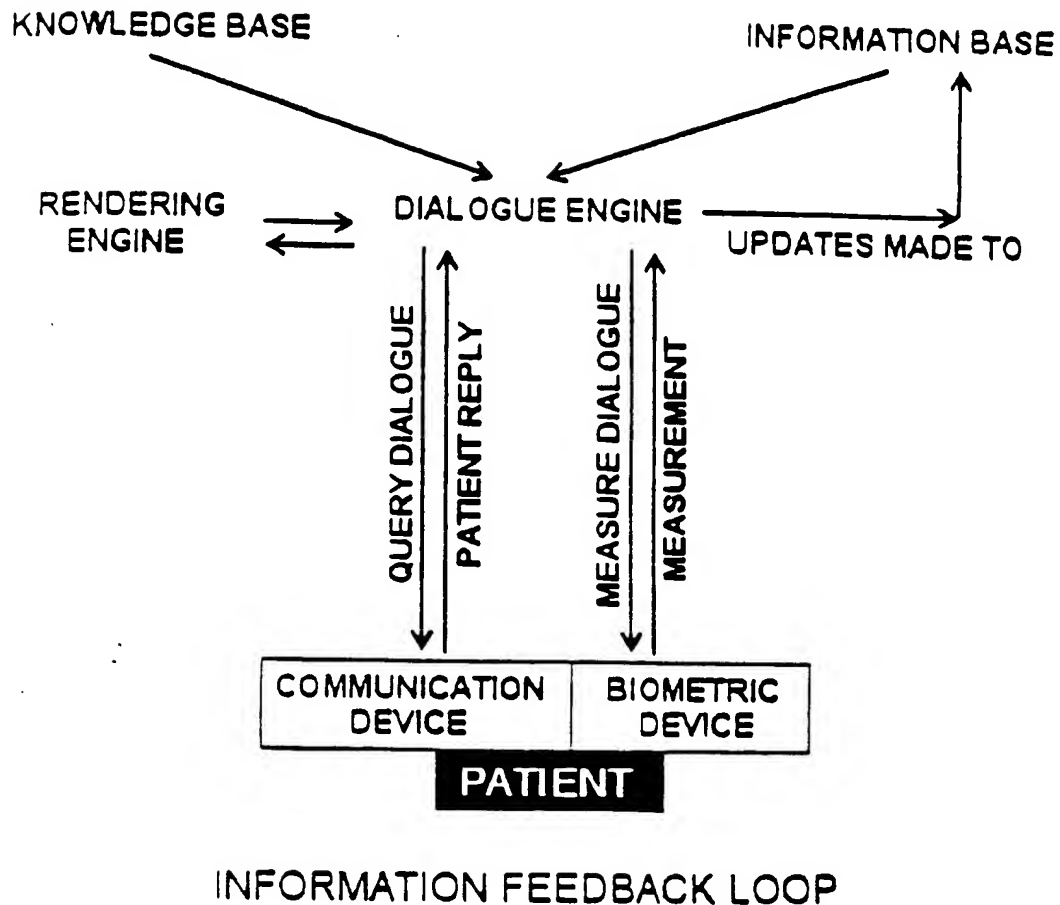


FIG. 11

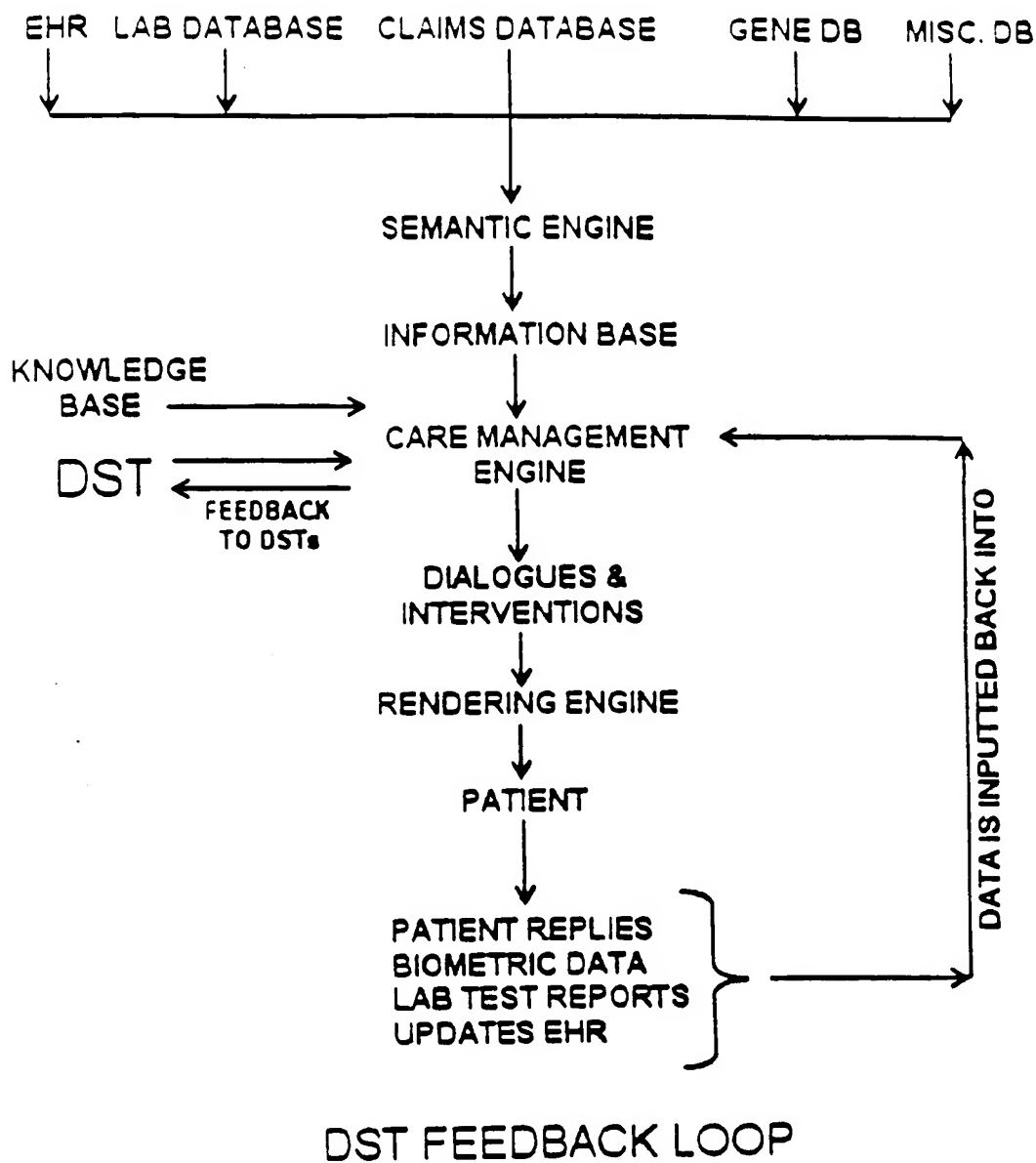
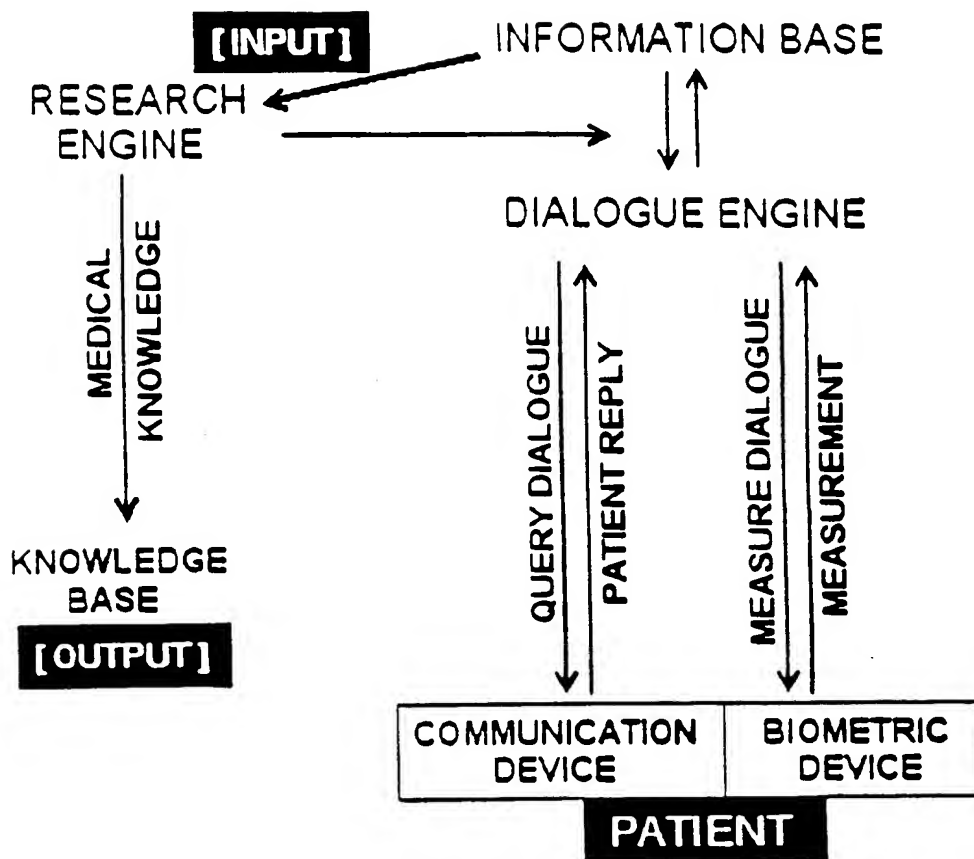


FIG. 12

Research Feedback Loop-



RESEARCH FEEDBACK LOOP

FIG. 13

Agenda

- Health Hero Network Background
- Current Technology Solutions
- Contribution to MedKnowledgeMent
 - Information and Knowledge Acquisition →
The Feedback Loops
 - Contribution to Innovations
 - Linkage to Other Parts of Project
 - Patient Trials and Expected Outcomes

FIG. 14

Health Hero Network Vision

- A better model of care is possible
- Crisis care → Coordinated care
- eHealth Networks and Technologies =
A Powerful Enabler

FIG. 15

Health Hero Network

- Founded 1988 in Mountain View, California. Health Hero Network Ltd established 2003 in Dublin, Ireland.
- 25 employees, \$5 million annual sales, serving 30 provider sites and 2500 patients with daily in-home monitoring.
- Solution Partners signed in Ireland, France, Netherlands. Expecting to add Spain, Belgium, Norway in 2003.
- Licensees include Veterans Health Affairs, Mercy Health System, American Medical Alert, TheraSense, Philips.

FIG. 16

eHealth Demonstration:

Veterans Health Affairs (US)

- Chronic care program using model of care based on eHealth Networks and Technologies from Health Hero Network
- 791 elderly high-risk patients with hypertension, heart failure, COPD, diabetes, enrolled for 1 year, compared to comparison group data
- Results (Disease Management, Volume 5, Number 2, 2002)
 - 63% reduction in hospital admissions
 - 60% reduction in hospital bed days
 - 40% reduction in emergency room visits
 - 64% reduction in nursing home admissions
 - 88% reduction in nursing home bed days
 - Significant improvement in Quality of Life

FIG. 17

eHealth Demonstration:

Mercy Health System (US)

- Diabetes management program using eHealth Networks and Technologies from Health Hero Network
- 169 low income diabetes patients, one year study period using comparative cohort data from previous calendar year
- Results (Diabetes Technology & Therapeutics Journal, Dec 2002)
 - Outpatient visits reduced 49% ($p < 0.001$)
 - Inpatient admissions reduced 32% ($p < 0.07$)
 - ER encounters reduced 34% ($p < 0.06$)
 - Significant increase in quality of life scores
 - Medication compliance increased from 34% to 94%

FIG. 18

Health Hero Network Platform

Vision: Open System for Chronic Care Research and Innovation, Any Device, Any Disease, Many Partners

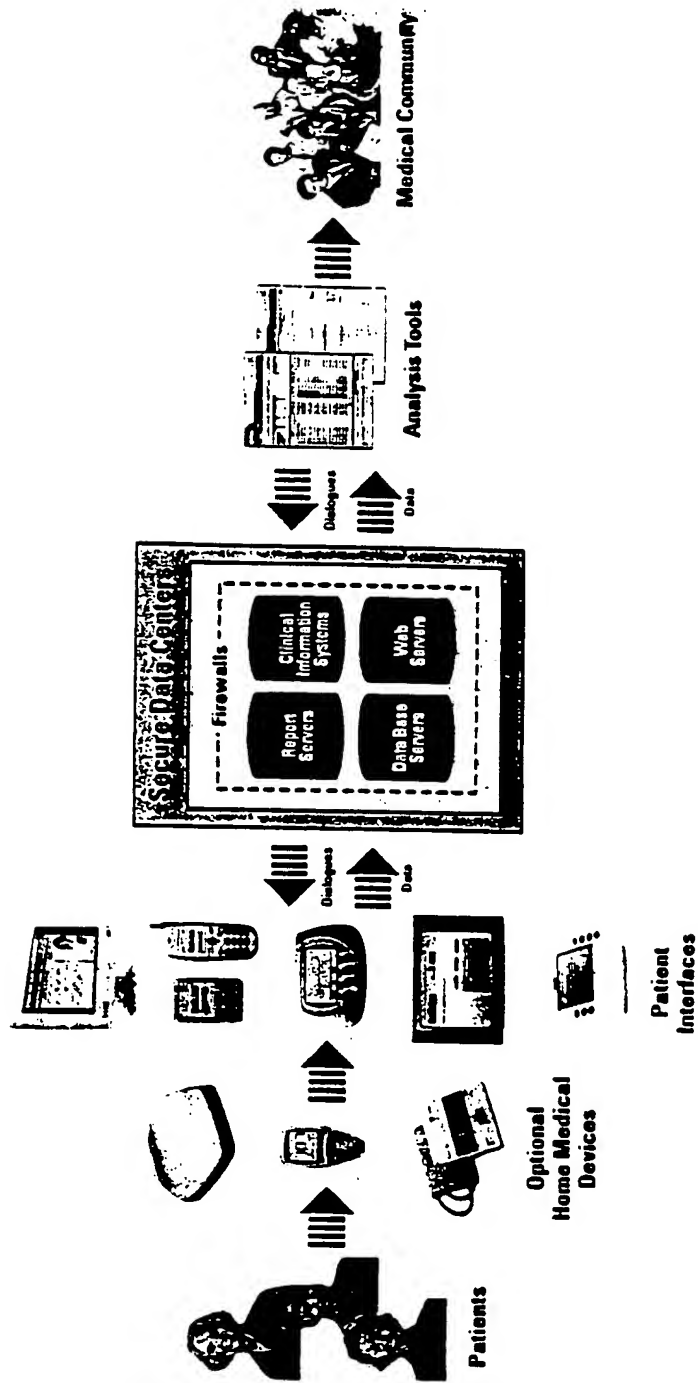


FIG. 19

Decision Support Tools for Caregivers

Vision: Intelligent, Simple, Web-based, Integrated with Existing Clinical Information Systems and Care Processes

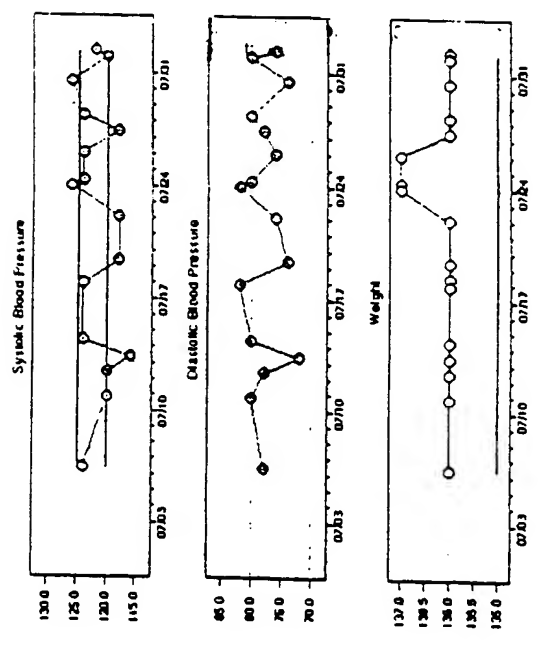
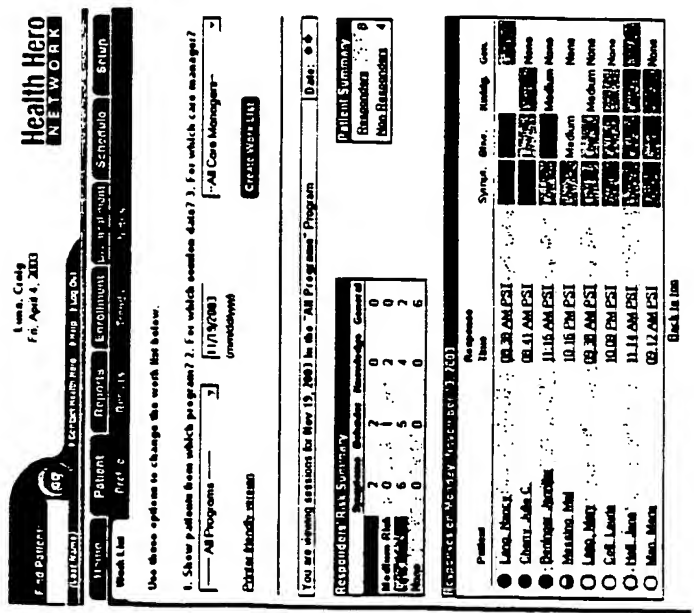


FIG. 20

Daily Dialogue with the Patient

Vision: Intelligent, Interactive, Personalized, Simple,
Integrated with Consumer and Medical Devices



120

Less More

OK

What is your weight today?

Hello Mary.

Reminder: A weight gain may be a sign of fluid retention. Be sure to take your medicines and call Dr. Jones if your weight goes up more than 3 pounds.

OK

Daily Health Quiz: What is the best way to avoid feeling thirsty?

1. Drink water constantly
2. Save your fluids for mealtime and when you are feeling very thirsty
3. Eat more salt

1 2 3

FIG. 21

Diemo Library / Demonstration day dialogue		Diemo Library / Demonstration day dialogue		Diemo Library / Demonstration day dialogue	
CHF Day, 0101		COPD Day		Diabetes Day	
<p>Diemo Library / Demonstration day dialogue</p> <p>Health Hero HEALTHWORKS</p> <p>CHF Day, 0101</p> <p>Diemo: Welcome back, Pat! Thank you for using the Health Buddy. Begin whenever you are ready.</p> <p>Pat: Greeting 2: None / General</p> <p>Diemo: Did you weigh yourself today? [Did you weigh today? Weight / Behavior]</p> <p>Pat: Yes</p> <p>Diemo: What is your weight today? [Use the arrows to indicate your weight] [Weight trend: Weight / Symptoms]</p> <p>Pat: 170</p> <p>Diemo: That is much higher than your usual weight. Sometimes weight can be affected by heavy clothing or shoes. Please be sure that you weighed yourself without heavy clothing or shoes. [Slightly higher: Weight / Symptoms]</p> <p>Pat: Okay</p> <p>Diemo: Remember, if your weight is up 3 or more pounds, call Dr. Wally today at 555-1212. [Remember: Weight / Symptoms]</p> <p>Pat: Yes</p> <p>Diemo: $[(\text{QWeight trend}) - (\text{MightWeight}) \div 2]$</p> <p>Pat: 0</p> <p>Diemo: This is somewhat higher than your usual weight. Sometimes weight can be affected by heavy clothing and shoes. Please be sure that you weighed yourself without heavy clothing or shoes. [Somewhat higher: Weight / Symptoms]</p> <p>Pat: Okay</p> <p>Diemo: $[(\text{QWeight trend}) - (\text{MightWeight}) \div 1]$</p> <p>Pat: 0</p> <p>Diemo: This is slightly higher than your usual weight. Sometimes weight can be affected by heavy clothing and shoes. Please be sure that you weighed yourself without heavy clothing or shoes. [Slightly higher: Weight / Symptoms]</p> <p>Pat: Okay</p>		<p>Diemo Library / Demonstration day dialogue</p> <p>Health Hero HEALTHWORKS</p> <p>COPD Day</p> <p>Diemo: For you! You may start at any COPD, so that you can take the disease process / Knowledge] disease process / Disease process and symptoms: Disease process</p> <p>Pat: 3 days? [More 3 & 5: None / report this to your doctor today, your doctor's instructions,] ng your doctor's instructions, instructions to keep up your health, ction are better, coughing up health: Lung function: Pulmonary / more shortness of breath than Knowledge: Pulmonary / not looking more shortness of medication, [Instruct: Pulmonary /</p>		<p>Diemo Library / Demonstration day dialogue</p> <p>Health Hero HEALTHWORKS</p> <p>Diabetes Day</p> <p>Diemo: You may start at any time. Blood sugar trend: Question</p> <p>Pat: Nothing to eat for 8 hours or more</p> <p>Diemo: Blood sugar 70 is considered to be low. Please take your medicine, take and snack as your doctor. [Response: Blood / Symptoms]</p> <p>Pat: Blood sugar between 70-130 is a healthy level. [Response: Monitoring / Symptoms]</p> <p>Diemo: Blood sugar between 131-239 is considered to be moderately high. Please use insulin or diabetes pills as your doctor. [Response: Blood / Symptoms]</p> <p>Pat: If you continue to have or worse for 3 days. [Response: Monitoring / Symptoms]</p> <p>Diemo: If over 240 is generally too high. Remember to take</p>	

CH2F **Chemical and Physical Properties 1.3**

FIG. 22

Health Hero Network Contribution to MedKnowledgeMent

- 1.1 Information and Knowledge Sources and Formats
- 1.2 Information Acquisition → Information Base
- 1.3 Knowledge Acquisition → Knowledge Base
- 1.4 Information and Knowledge Processing → DSTs to
identify gaps between Information Base and Knowledge
Base (i.e. gaps between what is and what should be)
- 1.5 Information and Knowledge Rendering → Rendering
Engine is the interface to end users
- 1.6 Information and Knowledge Acquisition → The
Feedback Loops

FIG. 23

Project Overview

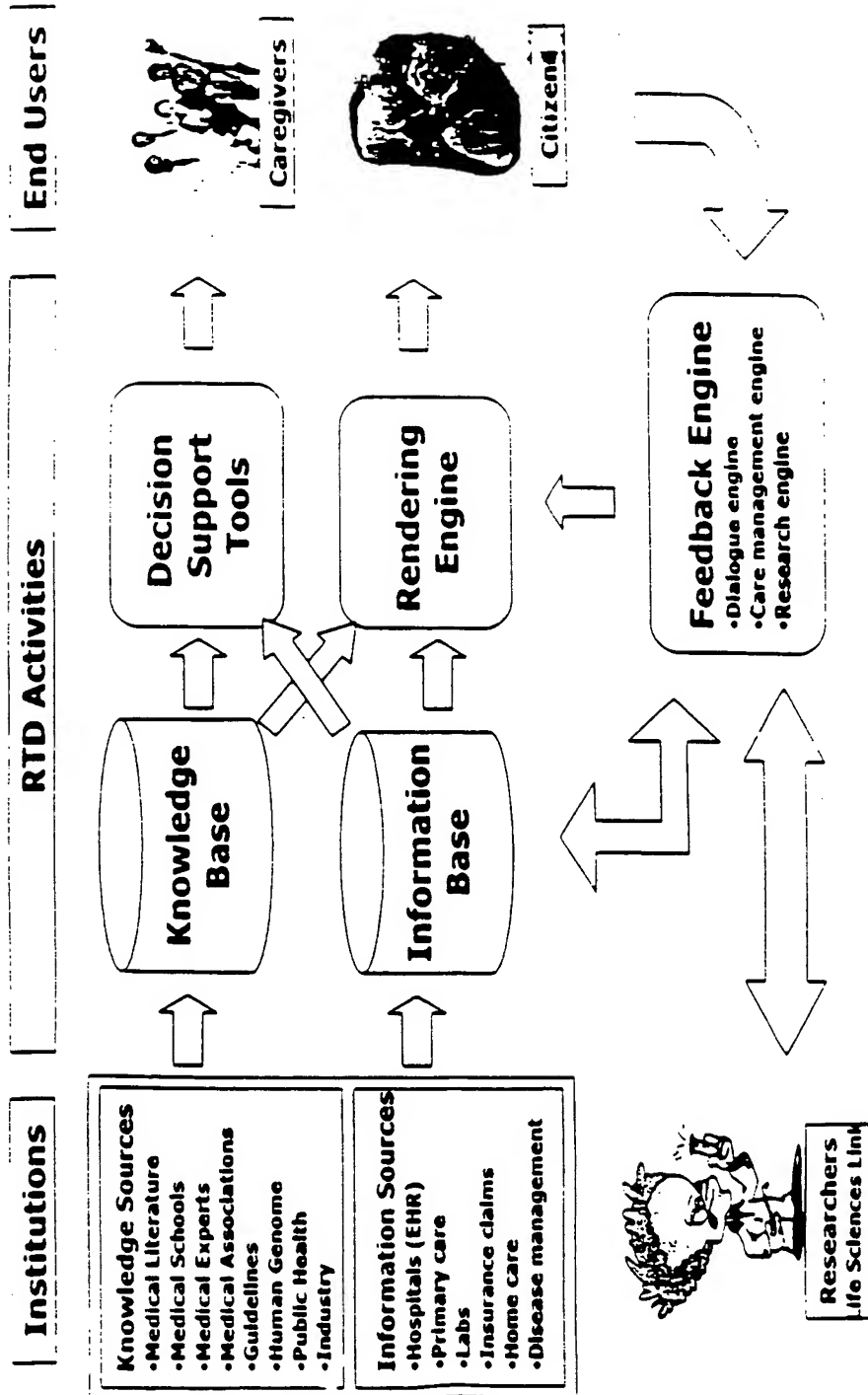


FIG. 24

Information and Knowledge Acquisition

→ The Feedback Loops

- Patient Dialogue Engine: Individualized Communication
 - Generated using Information and Knowledge Base
 - Interface with Rendering Engine
 - Feedback to Information Base
- Care Management Engine: Just-in-time Care
 - Generated using Information and Knowledge Base
 - Feedback to DSTs
- Research Engine: Real-time Research
 - Interface to Information Base [extract existing data]
 - Interface to Dialogue Engine [when new data is required]
 - Feedback to Knowledge Base [new discoveries]

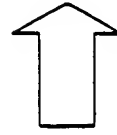
FIG. 25

Health Hero Network Contribution to Innovations

Current Status

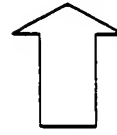
Patient Dialogue Engine

- Pre-packaged, mass customized programs
- Content libraries
- Health Buddy



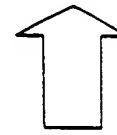
Care Management Engine

- Risk stratification
- Organizational workflow and efficiency tools
- Manual feedback process



Research Engine

- Data Export to SAS



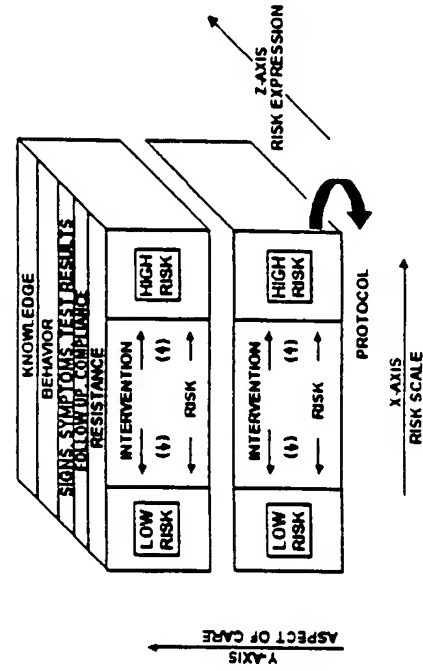
New Innovations

- Automated individualization
- Content generated by knowledge base rules applied to information base
- Interface to Rendering Engine for any device
- Intelligent risk tuning and link to DSTs
- Organizational optimization
- Automated feedback loop
- Identify subgroups and correlations
- Test hypotheses on living database

FIG. 26

Integrating Feedback Loops Within MedKnowledgeMent

- Application Program Interfaces
- Standards for Data Classification
- Ontology for Information and Knowledge Used in Feedback Process



A 3-DIMENSIONAL MODEL OF DISEASE

FIG. 27

Feedback Process

Overall goal is apply and generate medical knowledge in a continuous process that leads to lowest achievable risk resulting in:

- Higher quality of life
- Improved clinical outcomes
- Lower cost of care

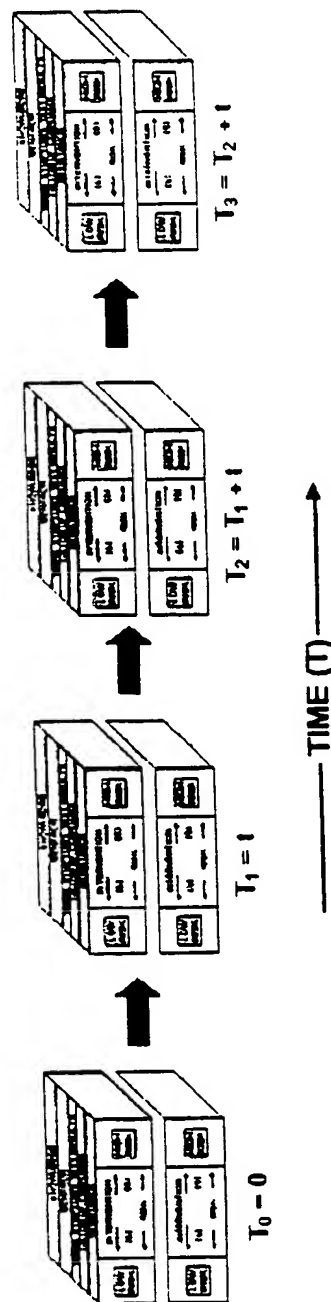


FIG. 28

Patient Trials

- Application to Major Diseases with Great Cost to Society
- Multi-center Demonstration Project
 - Health care and research centers in Europe
 - Large enough for meaningful result
 - Small enough to fit budget
- Standardized Protocol for Data Collection
- Outcomes Analysis
 - Aggregate data analysis for global impact
 - Site specific data analysis by country, disease, and care model
 - Key measures include: acceptability, satisfaction, utilization, clinical impact, medication compliance, quality of life, cost of care
- Medical Review Board
 - Review and approve all site specific study designs

FIG. 29

Expected Results

- Reduced emergency department encounters and hospitalizations by detecting patient problems before they become a crisis.
- Improved patient compliance by educating, motivating and monitoring health status and by providing personalized and relevant information.
- Improved safety and quality of care by providing timely and actionable information to healthcare professionals through quality assured processes that can be continuously improved.
- Continuity of care, particularly for the elderly, through integrated, interconnected monitoring and information systems, rather than fragmented, episodic, and crisis driven care.

FIG. 30

Expected benefit to the EU

Health is a key IST application for all citizens

- Stimulation of investment in information society technologies to modernize healthcare and enable sustained quality and access.
- Creation of an open platform for the application and generation of Medical Knowledge is an opportunity for European leadership at the convergence of information technologies, medical and consumer devices, and networks.
- Clinical applications that can be deployed as new service offerings over existing and new network infrastructures including broadband and wireless networks will stimulate the growth and success of those networks.
- The emerging eHealth sector will become vital to every region in the world that will experience the demands of an aging population and the resulting need for advanced and sustainable models of care.

FIG. 31